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RESPIRATOR SPEECH INTELLIGIBILITY TESTING WITH AN EXPERIENCED SPEAKER

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14. ABSTRACT
The Modified Rhyme Test (MRT) is used by the National Institute for Occupational Safety and Health (NIOSH) to assess speech intelligibility of commercial chemical, biological, radiological and nuclear (CBRN) air-purifying respirators (APRs). The speaker's sound output level, enunciation, accent, and pronunciation may adversely affect sound conveyance and speech intelligibility during respirator wear. It was postulated that an experienced speaker might induce higher intelligibility scores than a less experienced speaker. Twelve NIOSH-certified CBRN APRs that were evaluated previously using the NIOSH test method were used to conduct a modified version of the NIOSH MRT. Performance ratings with the experienced speaker (86.5% ± 0.6%) were significantly higher than those for the NIOSH method (84.0% ± 0.6%).

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PREFACE

The work described in this report was authorized under Project No. 9NBNN3. This work was started in October 2008 and completed in June 2009.

The use of either trade or manufacturers' names in this report does not constitute an official endorsement of any commercial products. This report may not be cited for purposes of advertisement.

In conducting the research described in this report, the investigators adhered to Army Regulation 70–25; *Research and Development: Use of Volunteers as Subjects of Research*; Headquarters, Department of the Army: Washington, DC, 25 January 1990.

The text of this report is published as received and was not edited by the Technical Releases Office, U.S. Army Edgewood Chemical Biological Center.

This report has been approved for public release.

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RESPIRATOR SPEECH INTELLIGIBILITY TESTING WITH AN EXPERIENCED SPEAKER

1. INTRODUCTION

First responders such as law enforcement officers and fire fighters need to communicate clearly with one another and the public when responding to incidents or performing operations that require the use of chemical, biological, radiological, and nuclear (CBRN) personal protective equipment (PPE). Specifically, respirators worn during CBRN PPE specific operations (e.g., terrorist events, clandestine laboratory responses, personnel recovery missions) can interfere with speech transmission and reception.

The National Institute for Occupational Safety and Health (NIOSH) air-purifying respirator (APR) CBRN standard[1] assesses speech intelligibility during mask wear using the Modified Rhyme Test (MRT).[2] The MRT consists of 50 six-word lists of monosyllabic English words, most having three sounds in a consonant-vowel-consonant sequence. The MRT requires listeners to correctly identify single-syllable words spoken by a respirator wearer. Sound output level, enunciation, accent, and pronunciation of the respirator-wearing test speaker may adversely affect the sound conveyance and speech intelligibility scores of a given respirator. The listeners must be attentive and have normal hearing. All participants must become familiar with unusual words in the MRT lists such as heave, heath, tam, din, and dun.

Prior research[3,4] evaluated twelve NIOSH-certified CBRN APRs following the NIOSH procedures. The Mine Safety Appliances (MSA) Millenium and 3M FR-M40 had significantly higher scores than the 3M FR-7800B. The Millenium also scored significantly higher than the AOSafety Peltor M-TAC. The performance ratings of the other eight masks were too similar to allow any further discrimination among the respirators. Therefore, it was concluded that the MRT, when conducted using the NIOSH standard, could identify gross differences in speech performance among respirators, but could not discriminate amongst those respirators with similar speech performance likely due to a large variability in listener scores . It was postulated that an experienced speaker who had participated in many speech intelligibility trials might induce higher intelligibility scores than a less trained speaker.

Therefore, a modified version of the NIOSH MRT was conducted to determine whether listener speech intelligibility scores were higher and less variable with an experienced speaker. A second objective was to determine whether the scores with the single speaker would allow better discrimination among APRs.

2. METHODS

Each of the twelve NIOSH-certified CBRN APRs used in the previous study[3,4] were used in this study. The respirators were: 3M FR-M40 (St. Paul, MN), Avon C50 (Avon Protection Systems, Inc., Cadillac, MI), AOSafety Peltor M-TAC (Aearo Technologies,

Indianapolis, IN), Draeger CDR 4500 (Draeger Safety Inc., Pittsburgh, PA), MSA Millenium (Mine Safety Appliances Company, Cranberry Township, PA), Survivair Optifit (Sperian Protection, Honeywell Safety Products Australia Tty Ltd, Victoria, Australia), MSA Ultra Elite, Scott M120 (Scott Health and Safety, Monroe, NC), North 5400 (North Safety, Honeywell, Cranston, RI), 3M FR-7800B, Scott M110, and Avon FM12.

2.1 Volunteers

Volunteers were recruited from the civilian and military workforce of the U.S. Army Edgewood Chemical Biological Center (ECBC), Aberdeen Proving Ground, MD. The test protocol was approved by the institutional review board at ECBC. All participants completed the Occupational Safety and Health Administration respirator medical evaluation questionnaire. A medical professional reviewed the questionnaires and determined that all volunteers were healthy and free of coronary risk factors. Each of the 13 male volunteers (23.2 ± 5.7 years) gave written informed consent prior to participation in the study. All volunteers were native speakers of American English and had normal hearing.

2.2 Test Procedures

All testing was conducted in the Respiratory Protection Branch's Individual Protective Equipment Test Facility. The trials followed a modified NIOSH MRT communications certification procedure. Deviations from the standard test procedures were: one male volunteer served as the speaker for all trials rather than having one female and four male speakers; the listener panels consisted of three male volunteers rather than one female and two males; and, the speaker read one of twelve word lists while wearing each of the twelve masks and one additional word list without the respirator to the same panel of listeners. There are twelve MRT word lists. With 13 trials in one day, one of the word lists was repeated. A different list was repeated on each of the four test days. Mask condition was the same for both the speaker and the listeners. Therefore, each listener participated in13 trials. All twelve respirators were tested on four separate test days with a different group of listener volunteers for each test day. The order of respirators tested on each day was randomized.

2.3 Equipment

All equipment used corresponded to that listed in the NIOSH standard and was the same as that used in the previous study.[3,4] In brief, a stereo amplifier, two loudspeakers, and a pink noise generator (Bruel and Kjaer Type 1405, Naerum, Denmark) were used to transmit pink noise at 60 ± 2 dBA. The noise levels were measured at the position of the listener's ear. The A-weighted fast response setting was used on the sound level meters (Model 322, Center Technology Corporation, Taipei, Taiwan). The meters were calibrated at the start of each test day. Once the meters were calibrated, the room background noise was set.

2.4 Data Analyses

2.4.1 Performance Ratings

Performance ratings were computed using the method outlined in the NIOSH test procedure. Scores were corrected for words misspoken by the speaker and for chance or guessing made possible by the multiple-choice form of the answer sheet. Misspoken words were identified by the test administrator. The score for an individual listener for each trial was calculated using the following equation:

$$\text{Adjusted Score}\,(\%) = \left(\frac{\#\,\text{Correct} - \#\,\text{Correct}/5}{\#\,\text{Words Spoken Correctly}} \right) \text{x}\,100 \qquad (1)$$

The performance rating for each listener was then calculated.

$$\text{Performance rating}\,(\%) = \left(\frac{\%\ \text{Adjusted Score with respirator}}{\%\ \text{Adjusted Score without respirator}} \right) \text{x}\,100 \qquad (2)$$

The scores from the three listeners were then averaged to obtain the performance rating of the mask.

2.4.2 Statistical Analyses

A one way Analysis of Variance (ANOVA) was performed (SigmaPlot v 12.0, Systat Software, San Jose, CA) to determine if there was a difference between the NIOSH and single speaker methods. A Friedman Repeated Measures (RM) ANOVA on Ranks was performed to determine if there were differences in performance ratings among respirators. A one way ANOVA on Ranks was also performed to determine if there were differences among the listeners. A one way ANOVA was not performed because the data were not normal. A one way ANOVA was performed to determine if there were differences among test dates for performance ratings and for the MRT scores for the respirator conditions and for the control condition. Two separate two-way RM ANOVA were performed to determine if there were differences in speaker sound level or background noise level among the test dates and from the beginning to the end of each trial. The Tukey Multiple Comparison Procedure was used to identify groups that differed. All tests were performed at the $p < 0.05$ level.

3. RESULTS

Performance ratings are shown for each of the twelve respirators in Table I. Data from the prior study[3,4] using the NIOSH method are also provided. Individual scores and performance ratings are provided in Appendix A.

Table 1. Performance Ratings for Single Speaker MRT and NIOSH Method

Mask	Single Speaker Performance Rating (%)	NIOSH Performance Rating (%)	Difference* (%)	Single Speaker Rank	NIOSH Rank
Millenium	92.5 ± 6.4	90.5 ± 1.9	2.0	1	1
FR-M40	91.4 ± 8.0	87.8 ± 3.2	3.6	2	2
Ultra Elite	84.4 ± 9.4	86.7 ± 3.5	-2.5	9	3
M110	90.9 ± 7.6	85.8 ± 5.9	5.1	3	4
5400	84.5 ± 5.1	84.9 ± 5.3	-0.5	8	5
M120	90.9 ± 6.0	84.8 ± 3.3	6.0	4	6
C50	86.9 ± 5.2	84.1 ± 6.5	2.8	6	7
FM12	86.5 ± 4.5	83.8 ± 2.7	2.7	7	8
Optifit	83.4 ± 9.5	80.8 ± 5.0	4.5	10	9
4500	81.2 ± 5.6	80.8 ± 1.3	0.3	11	10
M-TAC	88.1 ± 9.3	79.1 ± 4.0	9.0	5	11
FR-7800B	75.2 ± 9.2	78.1 ± 4.2	-2.7	12	12

* Difference is the single speaker performance rating minus the NIOSH performance rating

There was a statistically significant difference between the two methods. Performance ratings with the single experienced speaker (86.5% ± 0.6%, mean ± standard error of the mean) were statistically significantly higher than those for the NIOSH method (84.0% ± 0.6%). Differences between the average performance ratings for the two methods ranged from -2.7% to 9.0%.

The performance ratings and MRT scores for individual listeners are shown in Table 2.

Table 2. Average Performance Ratings and MRT Scores for Individual Subjects

Subject #	% PR	Score %	Control Score
287	93.3 ± 7.3	86.8 ± 6.7	92.8
288	91.6 ± 9.4	85.0 ± 8.7	92.8
289	88.5 ± 7.9	86.4 ± 7.7	97.6
308	88.8 ± 4.5	88.8 ± 4.5	100
309	87.8 ± 6.5	87.8 ± 6.5	100
310	84.6 ± 6.3	84.6 ± 6.3	100
322	88.7 ± 9.3	84.1 ± 6.5	97.6
323	85.9 ± 8.5	86.6 ± 9.1	97.6
324	86.0 ± 7.6	86.0 ± 7.6	100
336	83.8 ± 6.8	81.8 ± 6.6	97.6
337	80.5 ± 7.7	78.6 ± 7.5	97.6
338	78.2 ± 9.6	78.2 ± 9.6	100

For individual listeners, the performance ratings ranged from 78.2% ± 4.5% to 93.5% ± 9.6%. A one-way ANOVA on Ranks with Tukey post-hoc test showed that subjects 287 and 288 both had significantly higher performance ratings than subjects 337 and 338.

There was a significant difference among the test dates as determined by the ANOVA on Ranks. Average performance ratings on the fourth date (80.8% ± 8.2%) were significantly lower than the performance rating on the other three dates (91.2% ± 8.3%, 87.1% ± 5.9%, 86.9% ± 8.3%). MRT scores for the respirator conditions were also significantly lower on the fourth test date (79.5% ± 7.9%) than the scores on the other three dates (86.1% ± 7.6%, 87.1% ± 5.9%, 85.5% ± 8.2%). Average control scores for days 1 through 4 respectively, were 94.4% ± 2.8% (mean ± standard deviation), 100% ± 0%, 98.4% ± 1.4%, and 98.4% ± 1.4%. An ANOVA showed that there was a statistically significant difference in the control scores among test days. The Tukey post hoc test indicated that average control scores on the second date were different from those on the first test date. No other differences were indicated.

There were no statistically significant differences in either background noise or speaker sound level among test dates or during the duration of each test (beginning, middle, and end of each trial). Background noise levels for the four tests dates were 60.2 ± 0.5, 60.3 ± 0.5,

60.5 ± 0.4, and 60.2 ± 0.3, respectively. Speech sound levels for the four test dates were 80.1 ± 3.5, 80.6 ± 3.2, 80.4 ± 2.6, and 80.3 ± 2.7, respectively.

There were statistically significant differences among the respirators. The MSA Millenium, Scott M120, Scott M110, 3M FR-M40, and Peltor-AOSafety M-TAC had statistically significantly higher scores than the FR-7800B. The Millenium, Scott M120, Scott M110, and 3M FR-M40 scored significantly higher than the Drager CDR 4500.

4. DISCUSSION

The NIOSH MRT test standard specifies training of the speakers. However, speakers may not have experience with MRT trials prior to being asked to participate in a certification test. For this study, one experienced speaker who had participated in many MRT trials was used rather than five speakers (who may be experienced or novice) as specified by the NIOSH test standard. The trials with the experienced speaker resulted in performance ratings that were 2.5% higher on average for the twelve tested respirators. However, differences between the trials with the experienced speaker and the trials with the standard speaking panel ranged from -2.7% to 9%. While scores for nine of the respirators were higher with the experienced speaker, two were less, and one was essentially the same. So, while the difference between the two test methods was significant, the experienced speaker trials did not always result in higher performance ratings than the NIOSH method.

Listeners were trained on the test procedures and familiarized with the word lists. Even so, there was variability in the listener scores. Subjects 287 and 288 had performance ratings significantly higher than subjects 387 and 388. It was noted that subjects 287 and 288 had lower control scores (92.8%) than the other subjects. In fact, their control scores were almost two standard deviations from the average control score across all subjects. It was possible that their performance ratings were higher than the other subjects because their control scores were the lowest. The performance rating is determined by dividing the MRT score with the respirator worn by the MRT score without the respirator (control). If one subject has a lower control score than another, the same MRT score with a respirator will result in a higher performance rating. For example, if subject 1 has a control score of 90 and subject 2 has a control score of 100, an MRT score with a respirator of 85% for both subjects will result in a 94% performance rating for subject 1 (85/90) and a 85% performance rating for subject 2 (85/100). At least part of the reason subjects 287 and 288 had significantly higher performance ratings may have been due to their lower control scores. The ANSI Standard[5] recommends that listener training trials be completed until there is a plateau in the listener scores. Perhaps future tests should include multiple control trials to ensure that a true baseline has been assessed.

The two subjects with the highest scores participated on the first day while the two with the lowest scores participated on the fourth day. The performance ratings and respirator MRT scores were significantly lower on the fourth test date compared to the other three test dates. While the ANOVA indicated that there were significant differences in control scores on the test dates, the Tukey post-hoc test failed to find a difference at the $p < 0.05$ level. All testing took place in the same room with the same speaker and equipment. Speech sound

levels and background noise levels were not significantly different among the test days. The test administrator did not note anything that could explain the differences other than individual variability. While the speaker was highly trained, it is possible that he enunciated more clearly on some days, though this was not noticed at the time. The differences are likely just due to the highly subjective nature of the MRT test and the fact that many factors impact the performance rating.

The Millenium and the FR-M40 received the highest two performance ratings for both the single speaker trials and for the NIOSH-formatted trials. The FR-7800B ranked #12 by both methods. The M-TAC did much better with the single speaker (rank #5) than with the panel of speakers (rank #11). The Ultra-Elite dropped from rank #3 with the NIOSH speakers to #9 with the single speaker. The other respirators had similar performance ranks between the two methods and were within 1-3 position changes between the two methods. With the single speaker trials, more respirators had significantly higher scores than the FR-7800. And, several respirators performed statistically better than the CDR 4500. Similar to the results obtained with the standard NIOSH conduct of the MRT test, the MRT conducted with the experienced speaker was not able to discriminate among most respirators. The reason for the Millenium and FR-M40 receiving top scores under both methods and the FR-7800B receiving the lowest score is not clear from the data. However, anecdotally, the subjects and test administrator did note that subjectively, the Millenium and FR-M40 sounded more clear than the other respirators and that speech with the FR-7800B sounded muffled.

5. CONCLUSIONS AND RECOMMENDATIONS

Performance ratings with the single experienced speaker (86.5% ± 0.6%, mean ± standard error of the mean) were statistically significantly higher than those for the NIOSH method (84.0% ± 0.6%). However, the relative ranking of the twelve respirator models tested was essentially the same for both speaker conditions with only three respirators deviating more than 2 places in rank. The average performance rating across all respirators by listener during the trials with the experienced speaker ranged from 78.2% ± 9.6% to 93.5% ± 7.3%. So, while an experienced speaker will yield a small increase (2.5%) in performance rating, there is still a large amount of variability in listener performance even though speaker variability was controlled as much as possible. Future work will examine listener performance with an automated speaking headform, so that speaker enunciation, timing, and sound level are the same for all listeners regardless of the respirator condition or test day.

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APPENDIX
RAW DATA

Table A1. Raw data from MRT testing with a single trained speaker on 27 September 2008.

Mask	Test Date	Listener #	# Right	# Wrong	Score	% Score	PR%
None	1	287	47	3	46.4	92.8	
4500	1	287	43	7	41.6	83.2	89.7
5400	1	287	44	6	42.8	85.6	92.2
FR-7800B	1	287	40	10	38	76.0	81.9
C50	1	287	39	11	36.8	73.6	79.3
FM12	1	287	43	7	41.6	83.2	89.7
FR-M40	1	287	45	5	44	88.0	94.8
M110	1	287	47	3	46.4	92.8	100.0
M120	1	287	46	4	45.2	90.4	97.4
Millenium	1	287	48	2	47.6	95.2	102.6
M-TAC	1	287	46	4	45.2	90.4	97.4
Optifit	1	287	47	3	46.4	92.8	100.0
Ultra Elite	1	287	46	4	45.2	90.4	97.4
None	1	288	47	3	46.4	92.8	
4500	1	288	41	9	39.2	78.4	84.5
5400	1	288	42	8	40.4	80.8	87.1
FR-7800B	1	288	35	15	32	64.0	69.0
C50	1	288	44	6	42.8	85.6	92.2
FM12	1	288	42	8	40.4	80.8	87.1
FR-M40	1	288	48	2	47.6	95.2	102.6
M110	1	288	48	2	47.6	95.2	102.6
M120	1	288	45	5	44	88.0	94.8
Millenium	1	288	43	7	41.6	83.2	89.7
M-TAC	1	288	47	3	46.4	92.8	100.0
Optifit	1	288	44	6	42.8	85.6	92.2
Ultra Elite	1	288	46	4	45.2	90.4	97.4
None	1	289	49	1	48.8	97.6	
4500	1	289	42	8	40.4	80.8	82.8
5400	1	289	40	10	38	76.0	77.9
FR-7800B	1	289	37	13	34.4	68.8	70.5
C50	1	289	46	4	45.2	90.4	92.6
FM12	1	289	44	6	42.8	85.6	87.7
FR-M40	1	289	45	5	44	88.0	90.2
M110	1	289	44	6	42.8	85.6	87.7
M120	1	289	47	3	46.4	92.8	95.1
Millenium	1	289	47	3	46.4	92.8	95.1
M-TAC	1	289	48	2	47.6	95.2	97.5
Optifit	1	289	46	4	45.2	90.4	92.6
Ultra Elite	1	289	46	4	45.2	90.4	92.6

Table A2. Raw data from MRT testing with a single trained speaker on 13 December 2008.

Mask	Test Date	Listener #	# Right	# Wrong	Score	% Score	PR%
None	2	310	50	0	50	100.0	
4500	2	310	43	7	41.6	83.2	83.2
M120	2	310	46	4	45.2	90.4	90.4
Millenium	2	310	42	8	40.4	80.8	80.8
C50	2	310	43	7	41.6	83.2	83.2
FR-7800B	2	310	41	9	39.2	78.4	78.4
5400	2	310	42	8	40.4	80.8	80.8
M-TAC	2	310	46	4	45.2	90.4	90.4
Optifit	2	310	42	8	40.4	80.8	80.8
Ultra Elite	2	310	39	11	36.8	73.6	73.6
FM12	2	310	45	5	44	88.0	88.0
FR-M40	2	310	48	2	47.6	95.2	95.2
M110	2	310	46	4	45.2	90.4	90.4
None	2	309	50	0	50	100.0	
4500	2	309	44	6	42.8	85.6	85.6
M120	2	309	46	4	45.2	90.4	90.4
Millenium	2	309	47	3	46.4	92.8	92.8
C50	2	309	45	5	44	88.0	88.0
FR-7800B	2	309	45	5	44	88.0	88.0
5400	2	309	45	5	44	88.0	88.0
M-TAC	2	309	43	7	41.6	83.2	83.2
Optifit	2	309	46	4	45.2	90.4	90.4
Ultra Elite	2	309	41	9	39.2	78.4	78.4
FM12	2	309	47	3	46.4	92.8	92.8
FR-M40	2	309	50	0	50	100.0	100.0
M110	2	309	40	10	38	76.0	76.0
None	2	308	50	0	50	100.0	
4500	2	308	45	5	44	88.0	88.0
M120	2	308	47	3	46.4	92.8	92.8
Millenium	2	308	48	2	47.6	95.2	95.2
C50	2	308	46	4	45.2	90.4	90.4
FR-7800B	2	308	44	6	42.8	85.6	85.6
5400	2	308	44	6	42.8	85.6	85.6
M-TAC	2	308	46	4	45.2	90.4	90.4
Optifit	2	308	44	6	42.8	85.6	85.6
Ultra Elite	2	308	41	9	39.2	78.4	78.4
FM12	2	308	46	4	45.2	90.4	90.4
FR-M40	2	308	47	3	46.4	92.8	92.8
M110	2	308	46	4	45.2	90.4	90.4

Table A3. Raw data from MRT testing with a single trained speaker on 21 February 2009.

Mask	Test Date	Listener #	# Right	# Wrong	Score	% Score	PR%
None	3	323	49	1	48.8	97.6	
5400	3	323	45	5	44	88.0	90.2
FM12	3	323	42	8	40.4	80.8	82.8
C50	3	323	44	6	42.8	85.6	87.7
M-TAC	3	323	47	3	46.4	92.8	95.1
Millenium	3	323	48	2	47.6	95.2	97.5
Optifit	3	323	40	10	38	76.0	77.9
M120	3	323	45	5	44	88.0	90.2
Ultra Elite	3	323	42	8	40.4	80.8	82.8
FR-M40	3	323	41	9	39.2	78.4	80.3
4500	3	323	38	12	35.6	71.2	73.0
M110	3	323	48	2	47.6	95.2	97.5
FR-7800B	3	323	39	11	36.8	73.6	75.4
None	3	322	49	1	48.8	97.6	
5400	3	322	42	8	40.4	80.8	82.8
FM12	3	322	43	7	41.6	83.2	85.2
C50	3	322	44	6	42.8	85.6	87.7
M-TAC	3	322	38	12	35.6	71.2	73.0
Millenium	3	322	49	1	48.8	97.6	100.0
Optifit	3	322	45	5	44	88.0	90.2
M120	3	322	49	1	48.8	97.6	100.0
Ultra Elite	3	322	45	5	44	88.0	90.2
FR-M40	3	322	49	1	48.8	97.6	100.0
4500	3	322	41	9	39.2	78.4	80.3
M110	3	322	48	2	47.6	95.2	97.5
FR-7800B	3	322	40	10	38	76.0	77.9
None	3	324	50	0	50	100.0	
5400	3	324	42	8	40.4	80.8	80.8
FM12	3	324	46	4	45.2	90.4	90.4
C50	3	324	47	3	46.4	92.8	92.8
M-TAC	3	324	38	12	35.6	71.2	71.2
Millenium	3	324	47	3	46.4	92.8	92.8
Optifit	3	324	43	7	41.6	83.2	83.2
M120	3	324	47	3	46.4	92.8	92.8
Ultra Elite	3	324	44	6	42.8	85.6	85.6
FR-M40	3	324	47	3	46.4	92.8	92.8
4500	3	324	42	8	40.4	80.8	80.8
M110	3	324	47	3	46.4	92.8	92.8
FR-7800B	3	324	40	10	38	76.0	76.0

Table A4. Raw data from MRT testing with a single trained speaker on 4 April 2009.

Mask	Test Date	Listener #	# Right	# Wrong	Score	% Score	PR%
None	4	337	49	1	48.8	97.6	
4500	4	337	41	9	39.2	78.4	80.3
5400	4	337	43	7	41.6	83.2	85.2
FR-7800B	4	337	34	16	30.8	61.6	63.1
C50	4	337	45	5	44	88.0	90.2
FM12	4	337	42	8	40.4	80.8	82.8
FR-M40	4	337	40	10	38	76.0	77.9
M110	4	337	43	7	41.6	83.2	85.2
M120	4	337	42	8	40.4	80.8	82.8
Millenium	4	337	42	8	40.4	80.8	82.8
M-TAC	4	337	43	7	41.6	83.2	85.2
Optifit	4	337	36	14	33.2	66.4	68.0
Ultra Elite	4	337	42	8	40.4	80.8	82.8
None	4	338	50	0	50	100.0	
4500	4	338	39	11	36.8	73.6	73.6
5400	4	338	45	5	44	88.0	88.0
FR-7800B	4	338	33	17	29.6	59.2	59.2
C50	4	338	38	12	35.6	71.2	71.2
FM12	4	338	40	10	38	76.0	76.0
FR-M40	4	338	40	10	38	76.0	76.0
M110	4	338	45	5	44	88.0	88.0
M120	4	338	44	6	42.8	85.6	85.6
Millenium	4	338	42	8	40.4	80.8	80.8
M-TAC	4	338	46	4	45.2	90.4	90.4
Optifit	4	338	43	7	41.6	83.2	83.2
Ultra Elite	4	338	36	14	33.2	66.4	66.4
None	4	336	49	1	48.8	97.6	
4500	4	336	38	12	35.6	71.2	73.0
5400	4	336	39	11	36.8	73.6	75.4
FR-7800B	4	336	38	12	35.6	71.2	73.0
C50	4	336	44	6	42.8	85.6	87.7
FM12	4	336	43	7	41.6	83.2	85.2
FR-M40	4	336	42	8	40.4	80.8	82.8
M110	4	336	43	7	41.6	83.2	85.2
M120	4	336	42	8	40.4	80.8	82.8
Millenium	4	336	45	5	44	88.0	90.2
M-TAC	4	336	45	5	44	88.0	90.2
Optifit	4	336	46	4	45.2	90.4	92.6
Ultra Elite	4	336	44	6	42.8	85.6	87.7

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